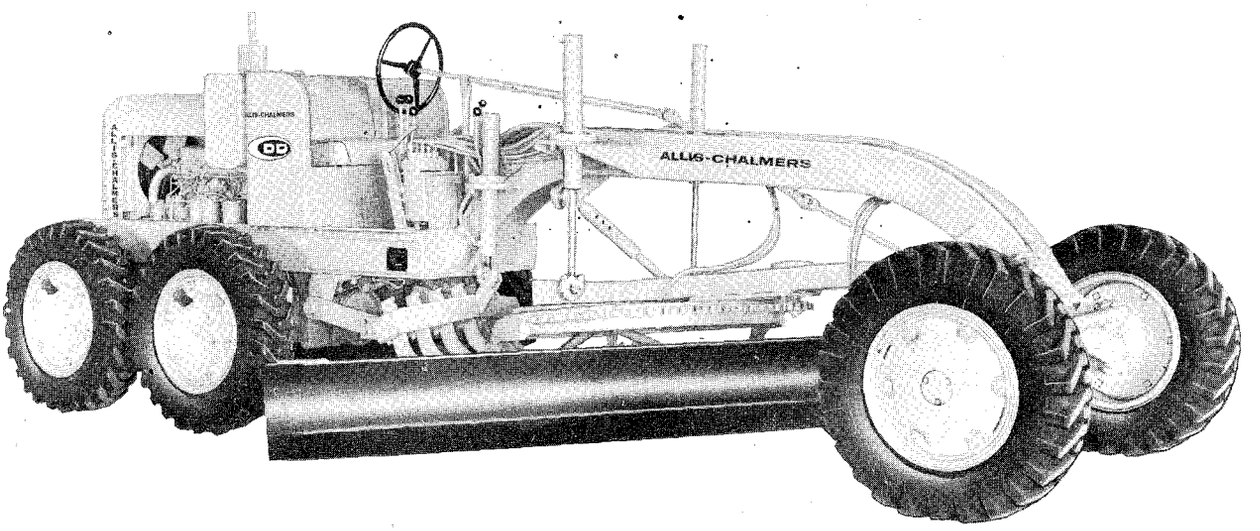
OPERATING INSTRUCTIONS
AND
FIELD MAINTENANCE

MODEL DD (Diesel)
MOTOR GRADER

(Effective with Serial No. 2573)



ALLIS-CHALMERS MFG. CO.
MILWAUKEE, WISCONSIN, U. S. A.

LITHO. IN U. S. A.

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THIS MANUAL SHOULD BE KEPT WITH THE MOTOR GRADER

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 DD Diesel Standard Motor Grader (Effective with Serial No. 2573). 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 "Allis-Chalmers" Parts obtained through your "Allis-Chalmers" Dealer.

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GENERAL DESCRIPTION

The standard Model "DD Diesel" Motor Grader (effective with Serial No. 2573) is a 9,350 pound unit designed for use in light construction and maintenance of roads, general grading, and snow removal. The main frame is of welded, box-type construction to provide the utmost in strength and rigidity and to provide unobstructed vision for the operator.

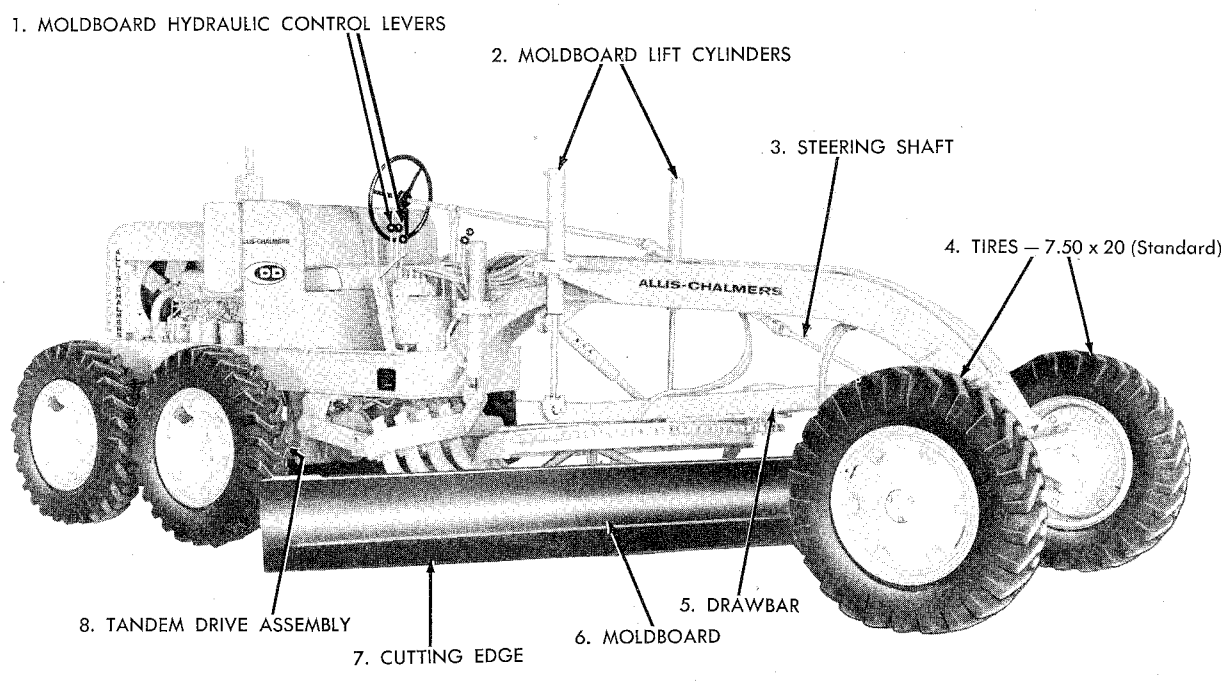
The grader is powered with an "Allis-Chalmers" 6 cylinder, 4 cycle Diesel engine. Power from the engine is transmitted through the engine clutch to the transmission and from the transmission to the tandem drive shafts. The tandem wheels are driven by roller chains which connect the sprockets on the wheel shafts and the sprockets on the tandem drive shafts.

A drum type mechanical brake, mounted on the transmission pinion shaft, is provided for stopping the grader.

The transmission, controlled by a gear shift lever, provides 4 forward speeds ranging from 2.7 M.P.H. to 21.0 M.P.H. and a reverse speed of 3.3 M.P.H.

The tires are partially filled with calcium chloride solution; this added weight increases traction and stability.

Hydraulic control levers for operating the moldboard, scarifier or snow plow are located directly in front of the operator. The moldboard can be rotated 122½ degrees, 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 10-foot moldboard is standard on the machine, however, 12-foot and 14-foot moldboards are also available. The arched front axle provides ample clearance for handling generous windrows of dirt, gravel or oil mix material. Provision is made for mounting and operating special equipment such as a scarifier, snow plow or loader.



Model DD Motor Grader

FIG. 1

GENERAL SPECIFICATIONS

General:

Weight — Approximate	9,350 lbs.
(With Scarifier)	9,700 lbs.
Weight on Front Wheels	2,760 lbs.
(With Scarifier)	2,860 lbs.
Weight on Rear Wheels	6,590 lbs.
(With Scarifier)	6,840 lbs.
Blade Pressure	4,900 lbs.
(With Scarifier)	5,080 lbs.
Overall Length	18 ft. 7½ in.
Overall Width	6 ft. ½ in.
Overall Height:	
Without Cab	6 ft. 1¾ in.
With Cab	7 ft. 6½ in.
Wheelbase	13 ft. 11½ in.
Turning Radius	32 ft. 10 in.
Tires (Standard) (6 P.R.)	7.50 — 20
Rim Type	Drop Center
Tires (Special Equipment): (6 or 10 P.R.)	8.25 — 20
Front Axle Clearance at Center:	
With 7.50 — 20 Tires	19 in.
Tandem Driving Chain:	
51 Pitch ⅞" Dia. Roller (prior to Grader Ser. # 2229)	
42 Pitch ⅞" Dia. Roller (effective Grader Ser. # 2229)	

Moldboard:

Lifting Mechanism	Hydraulic
Length (Standard)	10 ft.
Special Equipment	12 and 14 ft.
Maximum Reach Outside Front Wheels	48½ in. R. 42¾ in. L.
Number of Pitch Positions	6
Shift on Moldboard Arms	18 in. R. or L.
Maximum Lift Above Ground	12 in.
Ground Penetration	8 in.

Engine:

Make	"Allis-Chalmers" Diesel
Model	DD 262
Type	4 Stroke-Cycle (Naturally Aspirated)
Number of Cylinders	6
Bore	3 15/16 in.
Stroke	4⅜ in.
Crankshaft Rotation (Viewed from Fan End)	Clockwise
Number of Main Bearings	7
Piston Displacement	262 cu. in.
Lubrication	Full Pressure
Fuel Used	Diesel Fuel
Fuel Supplied by	"Roosa Master" Fuel Injection Pump
Low Idle Speed	600 to 650 R.P.M.
High Idle Speed	1765 to 1815 R.P.M.
Governed at Full Load	1650 R.P.M.

Road Speeds (At Rated Engine Speed):

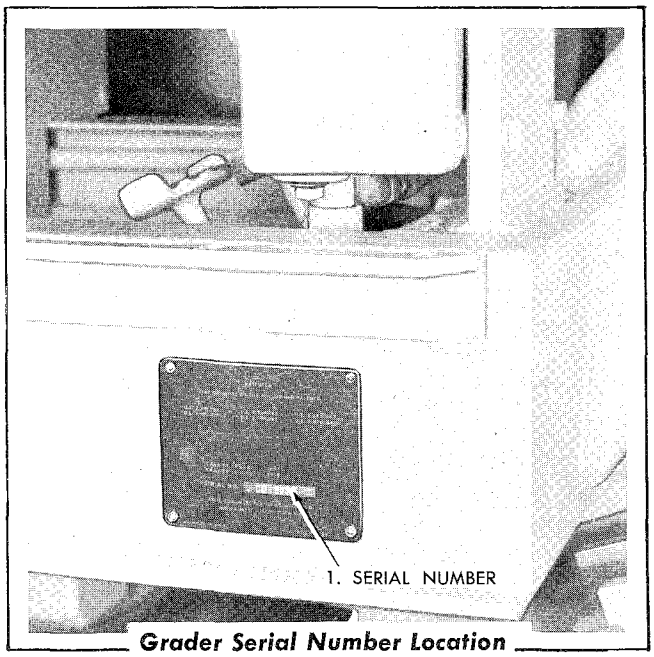
1st Gear	2.7 M.P.H.
2nd Gear	4.8 M.P.H.
3rd Gear	11.8 M.P.H.
4th Gear	21.0 M.P.H.
Reverse Gear	3.3 M.P.H.

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

Fuel Tank	27 gal.
Cooling System	4 gal.
Engine Crankcase and Filter	1¼ gal.
Transmission and Rear Axle Housing	4 gal.
Tandem Cases (each)	3 gal.
Steering Gear Housing	1 pt.
Hydraulic System	1¾ gal.

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.

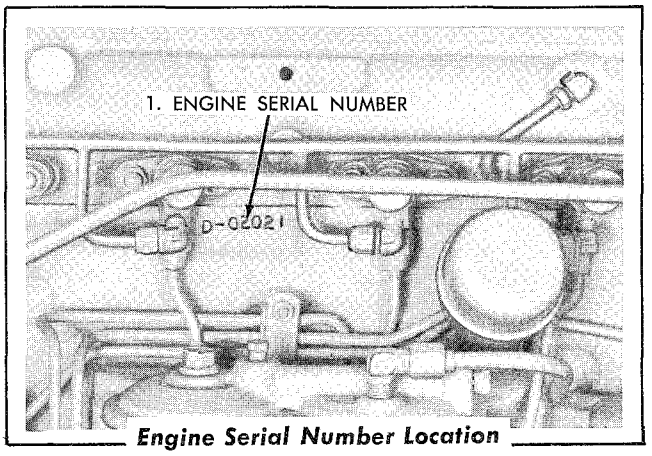
GRADER AND ENGINE SERIAL NUMBERS



Grader Serial Number Location

FIG. 2

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



Engine Serial Number Location

FIG. 3

The grader serial number is stamped on a plate attached to the right side of the main frame, below the operator's platform.

The engine serial number is stamped on the right side of the engine block, directly below the #3 fuel nozzle.

SPECIFICATIONS OF LUBRICANTS

A. Engine Crankcase Lubricant

USE NON-CORROSIVE "DIESEL" ENGINE CRANKCASE 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 "Service DM" or better. Heavy duty oils of the "Service DM" classification provides the most satisfactory lubrication for service normally experienced with this type application. This oil contains additives to promote cleanliness within the engine, which prevents the formation of sludge, hard carbon and "varnish" deposits on/or within engine parts.

"For Service DS" or Series 3 oil may be used at the owner's option. The "Service DS" oil is recommended for operation under very severe conditions and using fuel tending to produce excessive wear or deposits.

NOTE: *The engine crankcase on a new unit when shipped from the factory contains SAE 20W engine crankcase lubricant meeting the specification "For Service DS" or Series 3.* This oil is satisfactory for use until the first regular oil change. If additional oil is required, use oil of the classification "Service DM" or better.

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 source of supply of the lubricant used is to be held responsible for the results obtained from their products.

Proper operation and maintenance of the engine are necessary to obtain the desired results from the lubricating oil.

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

B. Transmission, Rear Axle Housing, and Tandem Drive Cases

Lubricate these assemblies 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

C. Steering Gear Housing

Use an SAE 90 EXTREME PRESSURE gear lubricant of a NON-CORROSIVE type in the steering gear housing.

D. 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 and MUST be water proof.

E. Hydraulic System

In the hydraulic system oils of the following specifications are recommended:

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

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

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

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

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

SPECIFICATIONS OF FUEL

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

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

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

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

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

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

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

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

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

A portable storage tank provides the best method for storing fuel on the job. In such a tank, the sediment and water can easily be drained and the fuel can be pumped into the 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 important that a sediment sump be provided in the bottom of the tank so that water and sediment can be drained daily.

Fuel should be allowed to settle at least 48 hours in a storage container before it is added to the fuel tank of the grader. It is advisable to use a pump and draw the fuel from the storage tank or barrel, rather than to drain it from the bottom of the fuel container. Where conditions are such that drums must be used to supply fuel, it is advisable to have enough drums to allow sufficient time for the fuel to settle. The fuel thus left in a number of drums can be collected into one drum and used after the usual time allowed for settling. In this manner, the sediment and foreign matter will be disposed of and no fuel will be wasted. Whenever drums are used for fuel storage, they should be covered or placed under shelter so that the fuel will not become contaminated by water, which will enter through the filter plugs when it rains, even though the plugs are tight.

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

PERIODIC LUBRICATION AND PREVENTIVE MAINTENANCE

Lubrication is an essential part of preventive maintenance, controlling to a great extent the useful life of the 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 lubricant should be warm (operating temperature) when draining at oil change intervals.*

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

10-HOUR SERVICES

CHECK:

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

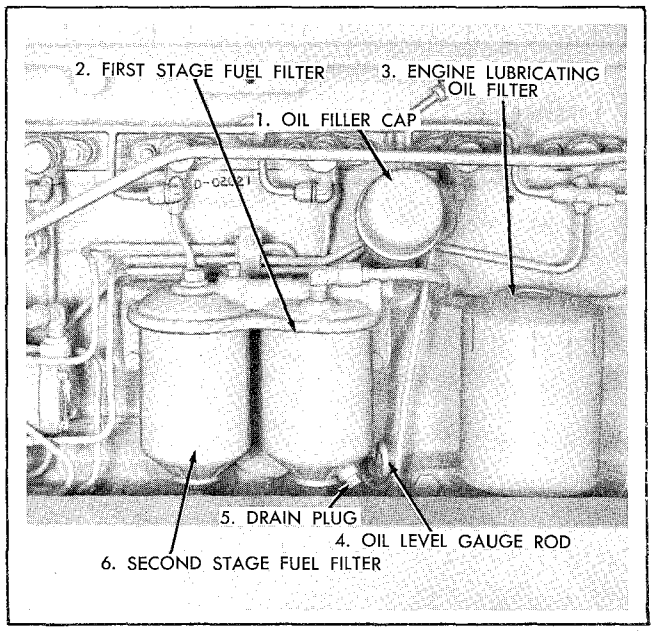


FIG. 4

ENGINE AIR CLEANER — Remove and clean dust cup (Fig. 5). Refer to "ENGINE AIR CLEANER" for detailed information.

RADIATOR — COOLANT LEVEL — Remove the radiator cap and check level of coolant. Keep the cooling system full by the addition of clean soft water or anti-freeze solution. Refer to "COOLING SYSTEM" for detailed information.

BATTERIES — 3 points each battery (Fig. 6). Check electrolyte level and test with hydrometer. Add clean distilled water to keep level ⅜ inch above plates. Keep tops of batteries clean and terminals free from corrosion. Refer to "ELECTRICAL SYSTEM" for detailed information.

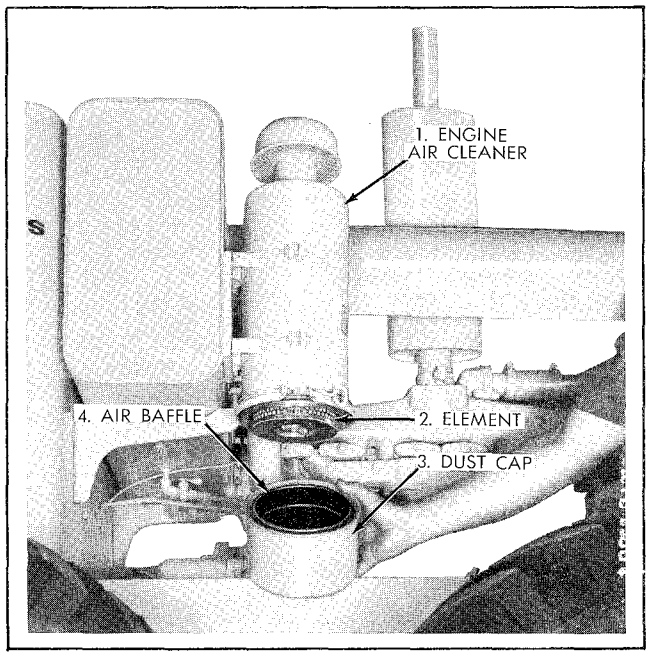


FIG. 5

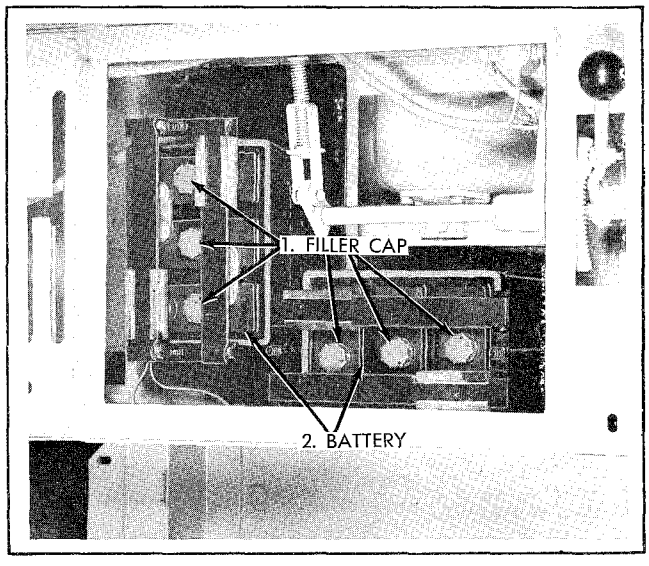


FIG. 6

HYDRAULIC LIFT SUMP TANK — Oil Level — Check oil level (Fig. 7). Add oil if necessary to raise level even with level plug opening.

FUEL FILTERS — Remove the drain plug (Fig. 4) from the first stage fuel filter shell daily (or as often as conditions warrant) and allow any water or sediment to drain; install the drain plug as soon as clean fuel runs out. Perform this service before the start of the day's operation in warm weather or shortly after the end of the day's operation in freezing weather.

SERVICE:

FUEL TANK — Fill the tank (Fig. 8) at the end of each operating period to keep condensation in the tank to a minimum (refer to "SPECIFICATIONS OF FUEL").

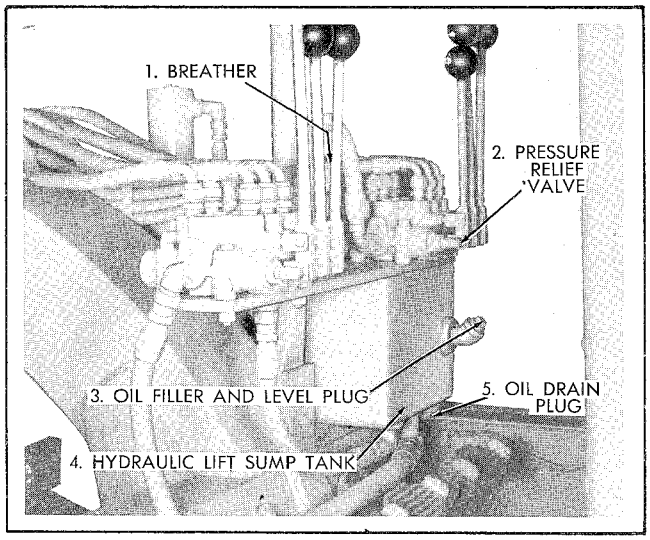


FIG. 7

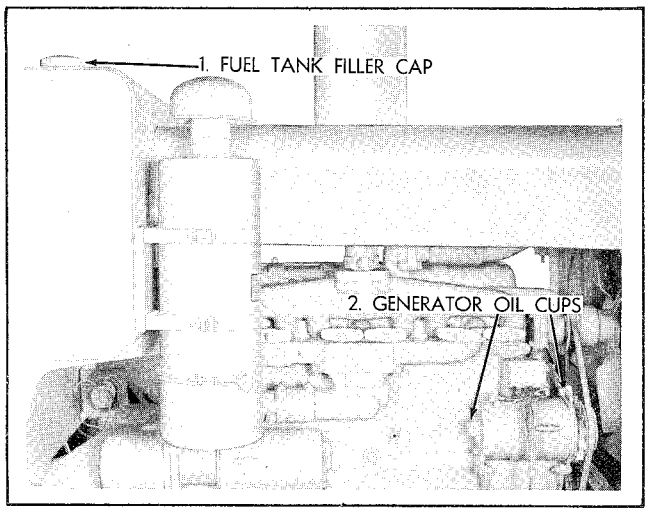


FIG. 8

LUBRICATE:

FRONT AXLE PIVOT PIN — 1 Lubrication point (Fig. 9). Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 4 to 6 shots).

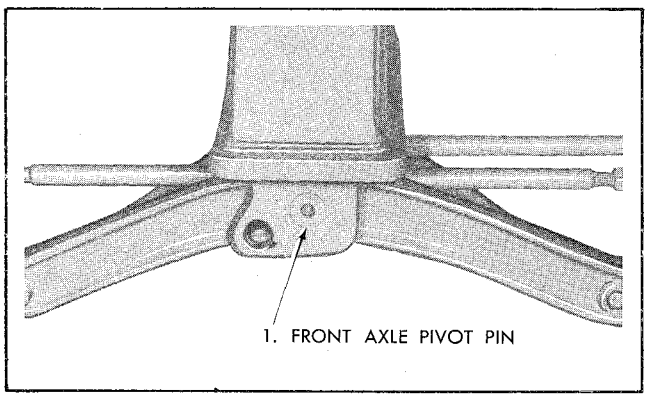


FIG. 9

TIE ROD ENDS — 1 Lubrication point each side (Fig. 10). Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 4 to 6 shots each).

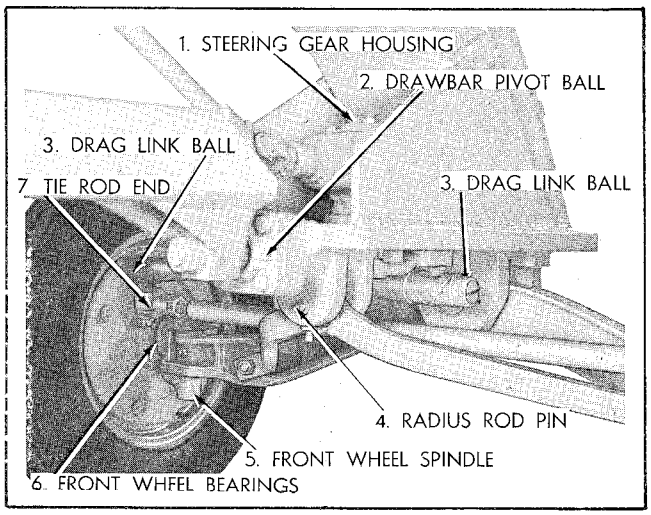


FIG. 10

FRONT WHEEL SPINDLES — 2 Lubrication points each side (Fig. 10). Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 4 to 6 shots each).

DRAG LINK BALLS — 2 Lubrication points (Fig. 10). Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 4 to 6 shots each).

SIDE SHIFT BALLS — 2 Lubrication points (Fig. 11). Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 4 to 6 shots each).

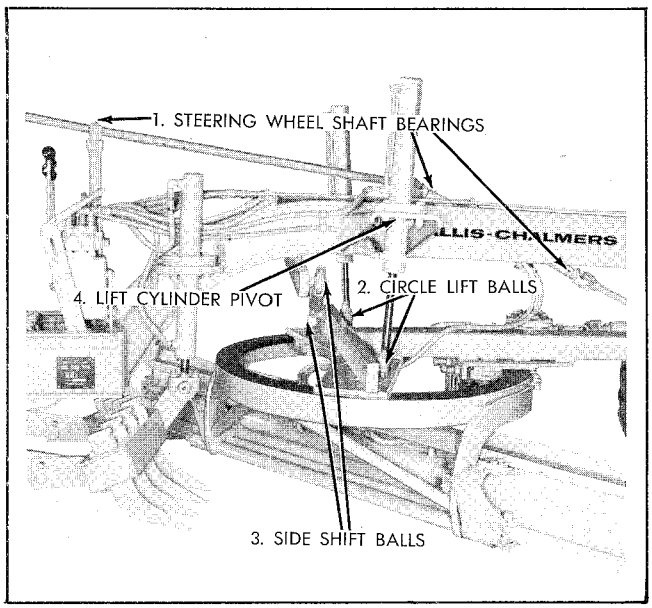


FIG. 11

CIRCLE LIFT BALLS — 1 Lubrication point each side (Fig. 11). Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 4 to 6 shots each).

TANDEM CASE PIVOT HUBS — 1 Lubrication point each side. (Fig. 12). Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 10 to 15 shots each).

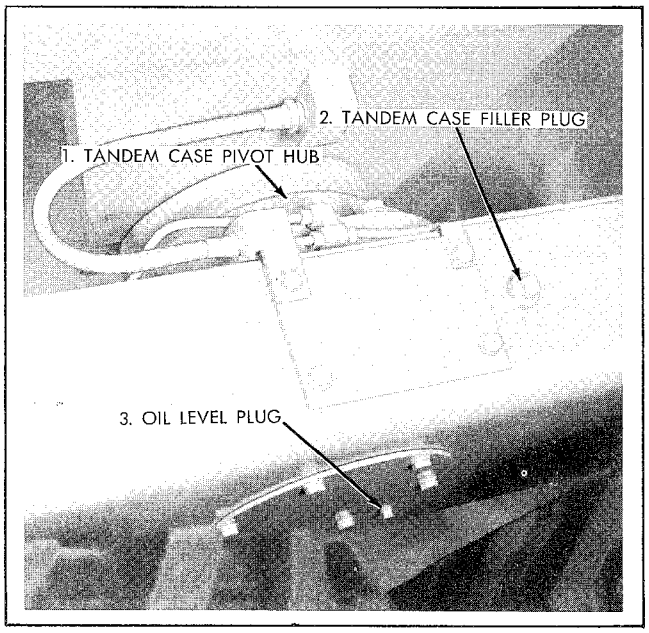


FIG. 12

LIFT CYLINDER PIVOTS — 1 Lubrication point each side (Fig. 11). Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 8 to 10 shots each).

STEERING WHEEL SHAFT BEARINGS — 3 Lubrication points (Fig. 11). Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 2 to 4 shots each).

DRAWBAR PIVOT BALL — 1 Lubrication point (Fig. 10). Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 8 to 12 shots).

RADIUS ROD PIN — 1 Lubrication point (Fig. 10). Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 4 to 6 shots).

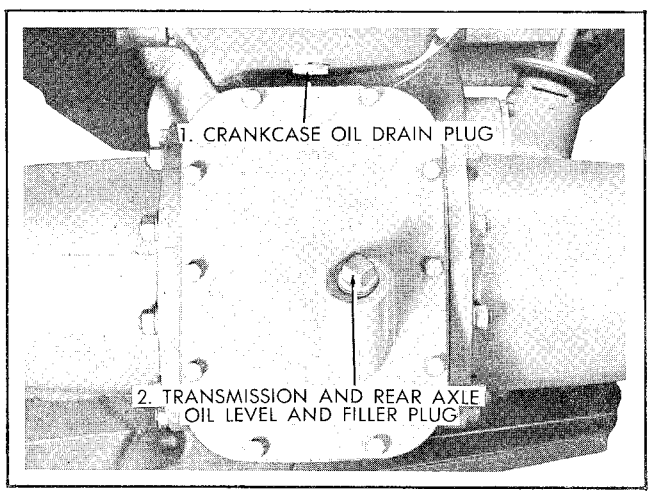


FIG. 13

100-HOUR SERVICES

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

SERVICE:

LUBRICATING OIL FILTER — REPLACE FILTER ASSEMBLY — (Fig. 4). Remove and replace filter assembly. Change more often if operating conditions warrant. Refer to "ENGINE LUBRICATION SYSTEM."

ENGINE CRANKCASE — CHANGE OIL — Operating conditions may necessitate this service at shorter intervals. Drain the oil when engine is at normal operating temperature. Remove drain plug (Fig. 13) and allow the oil to drain. Install and tighten oil drain plug. Fill the crankcase with new oil to the "FULL" mark on oil level gauge rod (Fig. 4). Refer to "SPECIFICATIONS OF LUBRICANTS." Crankcase and filter — Cap. 1¼ gal.

LUBRICATE:

GENERATOR — 2 Oil cups (Fig. 8). Lubricate with 3 drops of light engine oil in each oil cup.

200-HOUR SERVICES

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

CHECK:

TANDEM DRIVE CASES — OIL LEVEL — 1 Level plug each side (Fig. 12). Check oil level. Add oil if necessary to raise level even with oil level plug opening.

TRANSMISSION AND REAR AXLE HOUSING — OIL LEVEL — Check oil level (Fig. 13). Add oil if necessary to raise level even with oil level plug opening.

STEERING GEAR HOUSING — OIL LEVEL — Check oil level (Fig. 10). Add oil if necessary so that worm gear is ¾ submerged.

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

400-HOUR SERVICES

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

FIRST STAGE AND SECOND STAGE FUEL FILTERS — REPLACE ELEMENTS — Install a new element in each filter after every 400 hours of operation, or when the fuel pressure drops below normal range (40 to 70 psi.) due to clogging of the filter elements. Do not attempt to clean clogged filter elements. Refer to "FUEL SYSTEM" for detailed information.

1000-HOUR SERVICES

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

SERVICE:

HYDRAULIC LIFT SUMP TANK — Change Oil — Drain and refill (Fig. 7) with the specified lubricant. Cap. 1¾ gal. Refer to "HYDRAULIC SYSTEM" for detailed information.

TANDEM DRIVE CASES — CHANGE OIL — 1 Case each side (Fig. 12). Drain and refill with the specified lubricant. Cap. 3 gal. each.

TRANSMISSION AND REAR AXLE HOUSING — Change Oil — Drain and refill with the specified lubricant (Figs. 13 and 14). Cap. 4 gal.

LUBRICATE:

FRONT WHEEL BEARINGS — PACK — (Fig. 10). Remove each wheel and pack with wheel bearing lubricant.

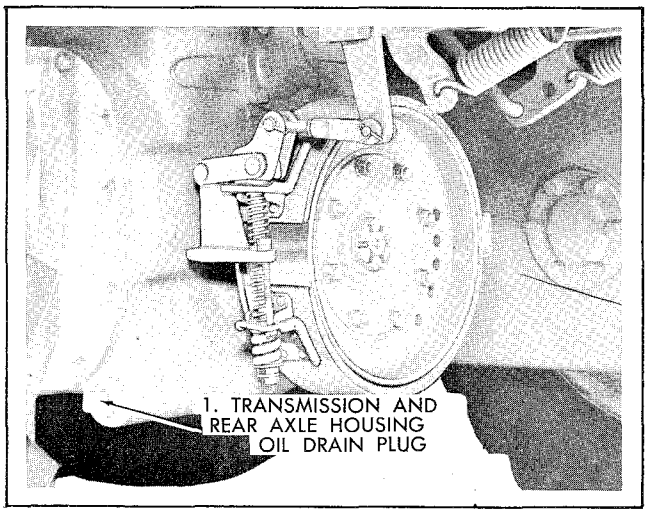


FIG. 14

SPECIAL EQUIPMENT

10-HOUR SERVICES

LUBRICATE:

SCARIFIER CYLINDER PIVOT — 1 Lubrication Point (Fig. 15). Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 8 to 10 shots).

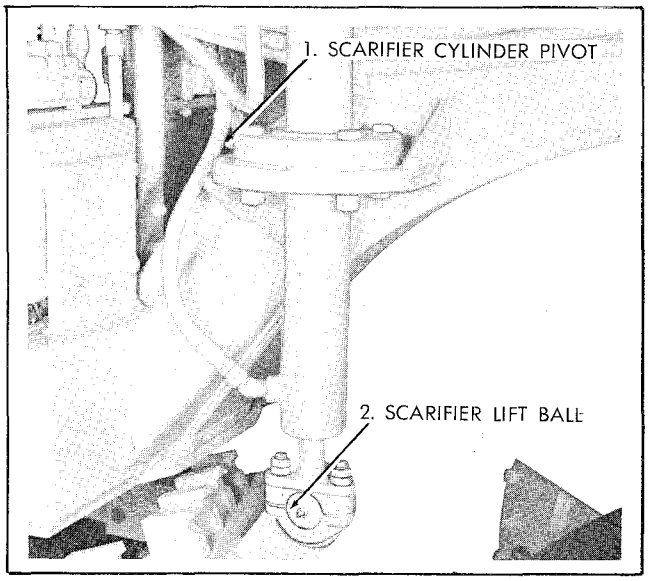


FIG. 15

SCARIFIER LIFT BALL — 1 Lubrication Point (Fig. 15). Lubricate with pressure gun lubricant. Use hand type lubricating gun approximately 4 to 6 shots).

SPINDLE UPPER BEARING — 1 Lubrication point each side (Fig. 16). Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 4 to 6 shots each).

FRONT AXLE PIVOT PIN — 2 Lubrication Points. Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 4 to 6 shots each).

RADIUS ROD PIN — 1 Lubrication Point (Fig. 16). Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 4 to 6 shots).

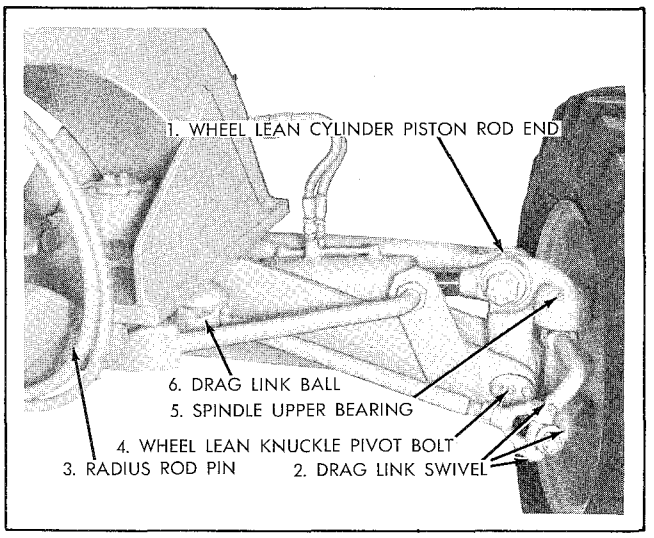


FIG. 16

DRAG LINK BALL — 1 Lubrication Point (Fig. 16). Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 4 to 6 shots).

WHEEL LEAN KNUCKLE PIVOT BOLT — 1 Lubrication point each side (Fig. 16). Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 4 to 6 shots each).

DRAG LINK SWIVEL — 3 Lubrication Points (Fig. 16). Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 4 to 6 shots each).

WHEEL LEAN CYLINDER PISTON ROD END — 1 Lubrication Point (Fig. 17). Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 4 to 6 shots).

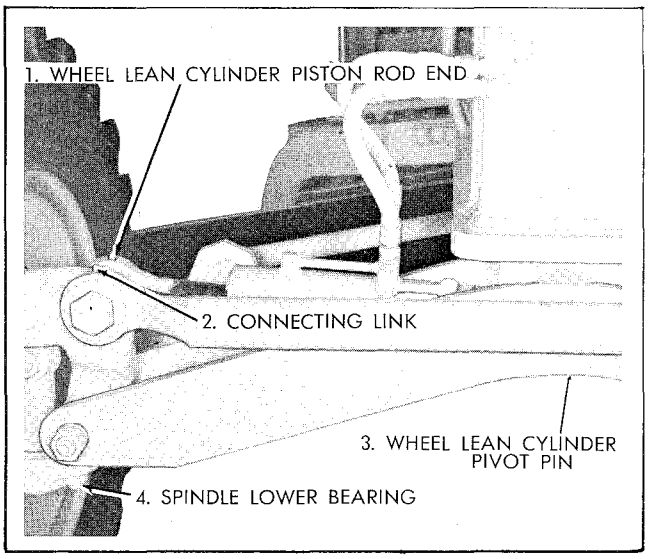


FIG. 17

CONNECTING LINK — 1 Lubrication point each end (Fig. 17). Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 4 to 6 shots each).

WHEEL LEAN CYLINDER PIVOT PIN — 1 Lubrication Point (Fig. 17). Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 4 to 6 shots).

SPINDLE LOWER BEARING — 1 Lubrication point each side (Fig. 17). Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 4 to 6 shots each).

MOLDBOARD SHIFTING CYLINDER BALLS — 1 Lubrication point each side (Fig. 18). Lubricate with pressure gun lubricant. Use hand type lubricating gun (approximately 4 to 6 shots each).

200-HOUR SERVICES

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

SERVICE:

CIRCLE TURN GEAR HOUSING — OIL LEVEL — Check oil level (Fig. 18). Add oil if necessary to raise level even with oil level plug opening.

1000-HOUR SERVICES

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

SERVICE:

CIRCLE TURN GEAR HOUSING — CHANGE OIL — Drain and refill to the proper level (Fig. 18) with SAE 90 EXTREME PRESSURE, non-corrosive lubricant.

PERIODIC SERVICES

STEERING GEAR HOUSING — Drain, clean, and refill to the proper level with SAE 90 viscosity EXTREME PRESSURE, non-corrosive type gear lubricant.

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

PERIODIC ADJUSTMENTS

FAN AND GENERATOR DRIVE BELT ADJUSTMENT — The drive belt is correctly adjusted when the straight right side of the belt can be depressed (by hand) approximately ½" to ¾" at a point half-way between the fan and the crankshaft pulleys. Refer to "COOLING SYSTEM" for detailed information.

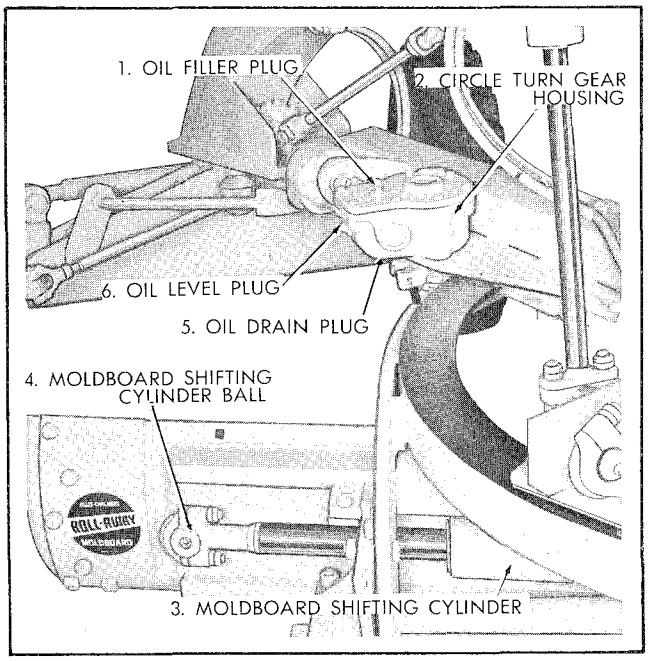


FIG. 18

BRAKE ADJUSTMENT — The brake should be checked and adjusted periodically to assure the correct brake operation. Refer to "BRAKE AND BRAKE ADJUSTMENT" for detailed information.

ENGINE CLUTCH ADJUSTMENT — Periodically, check the free travel of the clutch pedal. Keep the clutch linkage adjusted so that the pedal has approximately 1¾" of free travel. As the clutch facings wear, the free travel of the clutch pedal decreases; when the free travel has decreased to ¾", the clutch linkage must be adjusted. Refer to "ENGINE CLUTCH" for detailed information.

HYDRAULIC PUMP DRIVE BELTS — The hydraulic pump drive belts are correctly adjusted when they can be depressed (by hand) approximately 1" at a point half-way between the crankshaft and pump drive pulleys. Refer to "HYDRAULIC SYSTEM" for detailed information.

VALVE LASH — Remove the rocker arm cover periodically and check and adjust the valve lash. Refer to "VALVE ADJUSTMENT" for detailed information.

PREPARATION OF GRADER FOR USE

Make a complete inspection of the grader to make certain that no parts have been lost or damaged while in transit or in storage.

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

Check oil in engine crankcase, hydraulic lift sump tank, transmission and rear axle housing, and tandem cases (refer to "LUBRICATION GUIDE").

Lubricate all points indicated on the lubrication guide where fittings are provided for use of a pressure gun.

Make sure all tires are properly inflated. NOTE: *To minimize movement of the grader in its blocking while in transit, the tires were purposely "over-inflated" at the factory. Before unloading the grader from its carrier, reduce the inflation to pressures recommended (refer to "WHEELS AND TIRES").*

Operate the grader with a light load for the first 60 hours. The most efficient engine operation is obtained with the engine coolant temperature held within a range of 160° to 185° F. Operating the engine with the engine coolant temperature below this range will result in incomplete combustion of fuel, higher fuel consumption with less power, and will also cause harmful gummy deposits within the engine.

When operating in cold weather, provide a cover for the radiator and for the sides of the engine compartment if the thermostat fails to maintain the normal operating temperature of 160° to 185° F.

Inspect the entire motor grader after the first 10 hours of operation. Tighten all loose bolts and the wheel rim nuts. Check the adjustment of the engine clutch linkage, brake, and engine controls. Refer to pertinent sections of this book for adjustment procedures. Tighten wheel rim nuts again at the end of 60 hours of operation.

OPERATING CONTROLS AND INSTRUMENTS

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 and instrument.

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 graders

A. OPERATING CONTROLS

Throttle Lever

The throttle lever, located to the left of the operator's seat, is used to control engine speed and shut off the engine. Move throttle lever back to decrease engine speed or forward to increase engine speed as desired. To shut off the engine, pull throttle lever back to low idle stop on quadrant, then push throttle lever away from quadrant and back until engine stops.

Starter Switch

The starter switch, located to the right of the operator's seat, is a key operated switch. When the key is in a vertical position, the electrical circuit is open and the entire electrical circuit is inoperative. Turning the key to the right to the 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 the switch prevents starting the engine when the motor grader is parked or stored.

Clutch Pedal

The clutch pedal controls the engine clutch which transmits the power from the engine to the transmission. Press down on the clutch pedal (left pedal) to disengage the clutch when shifting gears and also when applying the brake to stop the grader.

Brake Pedal

Press down on the brake pedal (right pedal) to apply the brake to slow or stop the grader; disengage the engine clutch (depress clutch pedal) before the grader is brought to a complete stop.

Transmission Shift Lever

The transmission shift lever, located to the right of the operator's seat, is used to select the proper transmission gear ratio for the desired power or speed. The position, to which the shift lever must be moved for each of the 4 forward speeds and the reverse speed, is indicated on the gear shift diagram located on the gear shift lever guide plate.

Creeper Gear Transmission

(Special Equipment)

The creeper gear transmission is used to provide speeds $\frac{1}{3}$ of standard speeds in each gear range of the motor grader standard transmission. The creeper gear transmission shift lever, located to the left of the operator's seat, is used to engage or disengage the creeper gear transmission from the standard transmission. Pull the shift lever up to disengage the creeper gear transmission; push the shift lever down to engage the creeper gear transmission.

Steering Wheel

Turn the steering wheel to steer the grader.

Moldboard Hydraulic Lift Control Levers

The two lift control levers, located on the right side and in front of the operator, are used to raise and lower the moldboard. Push forward on the levers to lower and pull back on the levers to raise the moldboard as desired.

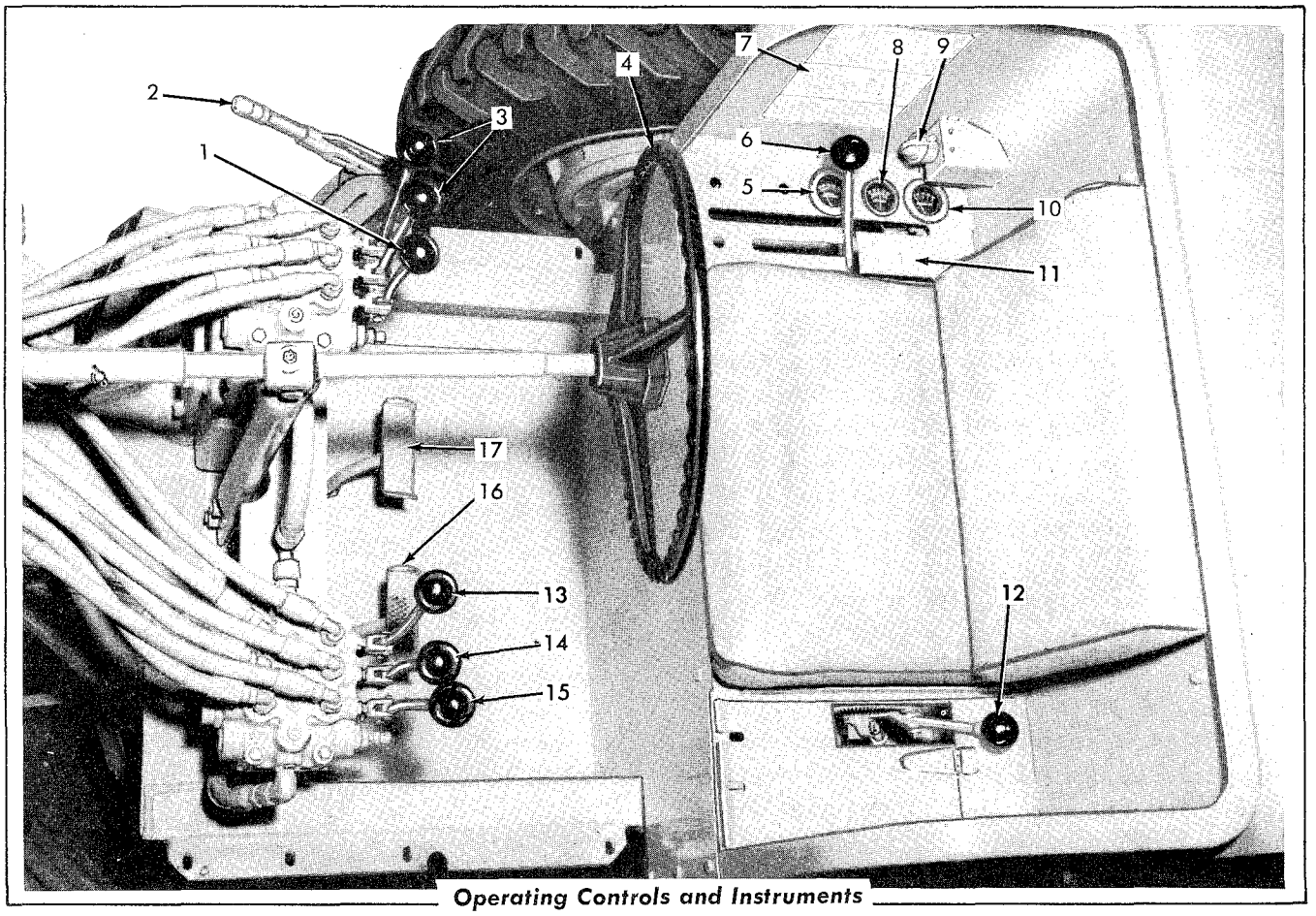
B. INSTRUMENTS

Engine Oil Pressure Gauge

The engine oil pressure gauge, located to the right of the operator's seat, indicates the pressure at which the engine lubricating oil is circulated through the engine. At full throttle, the oil pressure indicated by the gauge should be between 25 and 50 pounds at normal engine operating temperature. CAUTION: *If extreme or abnormal variations in the lubricating oil pressure should occur, the cause should be determined and corrected immediately.*

Ammeter

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



Operating Controls and Instruments

FIG. 19

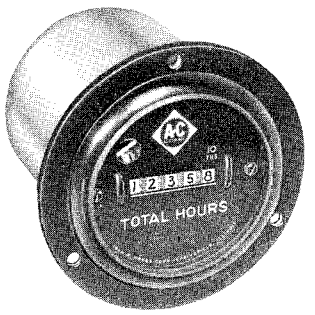
1. Scarifier Control Lever
2. Parking Brake (Special Equipment)
3. Moldboard Hydraulic Lift Control Levers
4. Steering Wheel
5. Engine Temperature Gauge
6. Transmission Shift Lever
7. Lubrication Guide Plate
8. Ammeter
9. Starter Switch
10. Engine Oil Pressure Gauge
11. Gear Shift Diagram
12. Throttle Lever
13. Front Wheel Lean Control Lever
14. Power Circle Turn Control Lever
15. Moldboard Side Shift Control Lever
16. Clutch Pedal
17. Brake Pedal

Engine Temperature Gauge

The engine temperature gauge, located to the right of the operator's seat, indicates the temperature at which the coolant is circulated through the cooling system. The normal engine operating temperature of the coolant is 160° to 185° F.

Fuel Pressure Gauge (Special Equipment)

The fuel pressure gauge, installed on the fuel inlet side of the fuel injection pump, indicates the pressure at which the fuel is delivered to the fuel injection pump by the fuel transfer pump. The gauge should indicate a pressure of from 40 to 70 psi.



Engine Hour Meter (Reading — 1235.8 Hours)

FIG. 20

Engine Hour Meter

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

STARTING AND STOPPING OF ENGINE

A. Starting of Engine

1. Before starting the engine, check the fuel level, crankcase oil level, hydraulic system oil level, and the level of the water or anti-freeze solution in the cooling system.

2. Place transmission shift lever in neutral position. Move throttle lever forward, past low idle stop on quadrant, to about ¼ throttle position.

3. Turn the starter switch key to actuate the starter. If the starter spins but does not crank the engine, release the starter switch key and allow the starter to stop spinning before using it again. CAUTION: *If the engine does not start within ½ minute, allow the starter to cool for 2 minutes before using it again.*

4. As soon as the engine starts, move the throttle lever forward to ½ throttle position and allow the engine to warm up.

5. Observe the pressure indicated by the engine oil pressure gauge. At full governed speed and with the engine coolant at normal operating temperature, the oil pressure should be between 25 and 50 pounds. If the oil is cold, no pressure may be indicated by the gauge for about 15 seconds after the engine starts, but if the pressure does not then rise to normal or above, the engine must be stopped immediately and the cause determined and corrected.

6. 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 the right as far as possible to actuate the starter, and at the same time spray starting fluid into the engine air cleaner until the 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 the engine starts, move the throttle lever forward to ½ throttle position and allow the engine to warm up.

B. Stopping of Engine

Move throttle lever toward the rear to low idle stop on quadrant and place the gear shift lever in neutral position. IMPORTANT: *Allow the engine to run at low idle speed for 3 to 4 minutes so that the engine may cool gradually and uniformly.*

Push throttle lever away from operator's seat and back to stop the engine. Cover exhaust pipe at the end of each days operation to prevent rain from entering while the grader is idle.

AVOID UNNECESSARY ENGINE IDLING

Prolonged engine idling causes the engine coolant temperature to fall below the specified operating range of 160° to 185° F.

Since starting of the engine is readily accomplished with an electric starter, there should be no reason for prolonged engine idling. Stop the engine when prolonged idling periods might occur.

DRIVING INSTRUCTIONS

The driving controls, which consist of the throttle lever, clutch and brake pedals, gear shift lever, and steering wheel are used when driving the grader.

The transmission gears can be shifted through the four forward speed ranges while the grader is in motion. However, when the grader is working it should be started in the gear range required to move the load. When starting the grader, depress the clutch pedal and shift to the desired speed range to meet the operating requirements, then release the clutch pedal slowly and smoothly so that the load will be picked up by the engine without a sudden jerk. Do not slip the clutch in an effort to pull an over-load. Avoid unnecessary wear on the clutch by shifting to a lower speed range. CAUTION: *Do not "ride" the 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 the engine to operate at full speed. This will not only assure the most power from the engine but will also allow the engine to operate at its highest efficiency. Start into a cut with the transmission gears shifted into the speed range that will permit completing the cut without further shifting, thus avoiding unnecessary wear on the engine clutch.

Keep the 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 links to change the pitch of the blade. 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 the moldboard.

B. Moldboard Angle Adjustment

To change the angle of the moldboard, lower one end of the moldboard to the ground, and pull the circle lock control chain to raise the lock from its hole in the circle. Drive the grader either forward or backward until the desired angle of the moldboard is obtained and release the chain; the lock will automatically enter the nearest adjustment hole in the circle to lock the moldboard in position.

C. Moldboard Pitch Adjustment

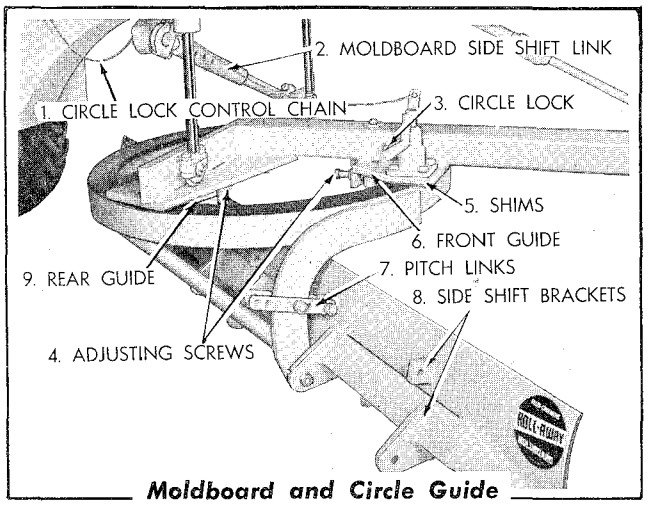
To change the pitch of the moldboard, lower the moldboard to the ground. Loosen the moldboard pivot bolts, remove the bolts from the pitch links, then move the grader forward or backward until the moldboard has the desired pitch position. Install and tighten the pitch link bolts and tighten the pivot bolts.

D. To Offset Moldboard

Minor side shift adjustments may be made by removing the pin from the side shift link and rod and reinstalling the pin in the proper holes when the desired side shift is obtained.

The moldboard may be offset on the moldboard arms 18" to the right or left. Lower the moldboard to the ground and place a block under one of the brackets on the back of the moldboard to keep it from tipping; then remove the moldboard pivot bolts and the pitch link bolts. After these bolts have been removed, move the grader back until the moldboard arms will clear the brackets on the back of the moldboard, then move the grader to the position where the arms can be connected to the desired brackets.

Install the pivot bolts at the bottom of the moldboard and connect the pitch links in the new position. Tighten the pivot bolts after the pitch links have been connected.



Moldboard and Circle Guide Adjustments

FIG. 21

E. Moldboard Cutting Edges

The moldboard cutting edges should be removed and sharpened when they become blunt. New cutting edges should be installed before the old ones are worn to a point where further use would cause wear on the main structure of the moldboard.

F. Care of Moldboard Circle

The face of the moldboard circle was painted at the factory to prevent rusting. Do not use oil or grease on the circle face as this 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 help in preventing mud or snow from freezing to the circle when operating in cold weather.

G. Vertical Adjustment

Eliminate excessive play between the face of the circle and wear plates by the removal of shims between the wear plates and circle guides. Each shim is $\frac{1}{32}$" thick. Rotate the circle after the shims have been removed and guide bolts tightened, to make sure there is $\frac{1}{16}$" clearance at the tightest point and the circle turns freely in the guides. Make the adjustment on one guide at a time.

H. Horizontal Adjustment

After the vertical adjustment of the circle has been made, loosen the lock nuts on the adjusting screws of the circle front and rear guides. Loosen the circle guide nuts then turn the adjusting screws as necessary to provide $\frac{1}{16}$" clearance between the inner circumference of the circle and each of the guide plates. Tighten the circle guide nuts and check to make sure the circle turns freely.

COLD WEATHER OPERATION

When atmospheric temperature drops to the freezing point or below, the engine crankcase and other oil compartments must be drained and refilled with oil of lighter viscosity (refer to "SPECIFICATIONS OF LUBRICANTS").

The engine cooling system must be checked for leaks and filled with an anti-freeze solution to protect it from freezing.

If the grader is to be operated in arctic temperature, 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 the oil in the hydraulic system to circulate and reach operating temperature before applying load to the hydraulic system.*

In winter weather, use a permanent type (glycol base) anti-freeze solution in the system to protect against damage from freezing. This type of anti-freeze has a much higher boiling point than water. After any addition of water or anti-freeze compound, test the solution after the added quantity has become thoroughly mixed to make sure it will withstand the prevailing or anticipated temperature. IMPORTANT: *The quantity of anti-freeze to be added to the cooling system to provide adequate protection must be in accordance with the anti-freeze manufacturer's directions.*

A. 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 farm weather operation. CAUTION: *Never add a rust inhibitor to a cooling system that contains an anti-freeze solution.* Drain and flush the cooling system 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, water pump, and generator drive belt must be kept properly adjusted.

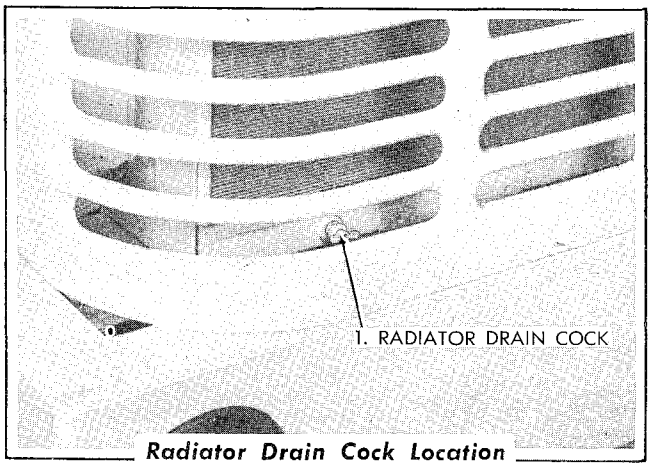
It is recommended that one ounce of "Allis-Chalmers" Cooling System Conditioner be added to each five gallons of coolant when a rebuilt engine is put back into service. This conditioner can be purchased from your "Allis-Chalmers" Dealer. Operate engine for 60 hours with conditioner in cooling system, then drain cooling system and refill with fresh water or permanent type anti-freeze solution.

B. Draining the Cooling System

Remove the radiator filler cap from the top of the radiator. Open the drain cock located in the front side of the radiator lower tank. Open the cylinder block drain cock, located in the left side of the cylinder block, and allow the system to drain. CAUTION: *When draining the cooling system in freezing weather, make certain that the coolant flows freely from both drain cocks and that the system drains completely.*

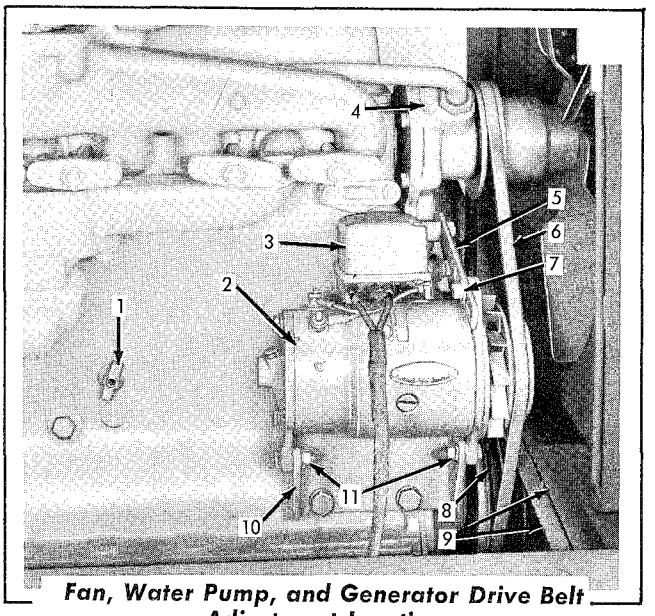
C. Filling the Cooling System

Refer to Paragraph B above and close the drain cocks which were opened to drain the cooling system. Fill the cooling system through the radiator filler tube until the coolant level is within approximately one (1) inch of the top of the radiator. Install the radiator filler cap and tighten securely.



Radiator Drain Cock Location

FIG. 22



Fan, Water Pump, and Generator Drive Belt Adjustment Location

FIG. 23

1. Cylinder Block Drain Cock
2. Generator
3. Generator Regulator
4. Water Pump
5. Adjusting Arm
6. Fan, Water Pump and Generator Drive Belt
7. Adjusting Arm Capscrew
8. Hydraulic Pump Drive Pulley
9. Hydraulic Pump Drive Belts
10. Generator Mounting Bracket
11. Generator Mounting Capscrews

D. Fan, Water Pump, and Generator Drive Belt Adjustment

The fan, water pump, and generator drive belt is correctly adjusted when the straight right side of the belt can be pressed inward (by hand) approximately ½ to ¾ inch at a point half-way between the crankshaft and fan pulleys.

To adjust the belt, loosen the adjusting arm capscrew at the rear end of the generator and loosen the generator mounting capscrews, then move the generator in or out until the correct tension of the belt is obtained. Tighten the adjusting arm capscrew and the generator mounting capscrews.

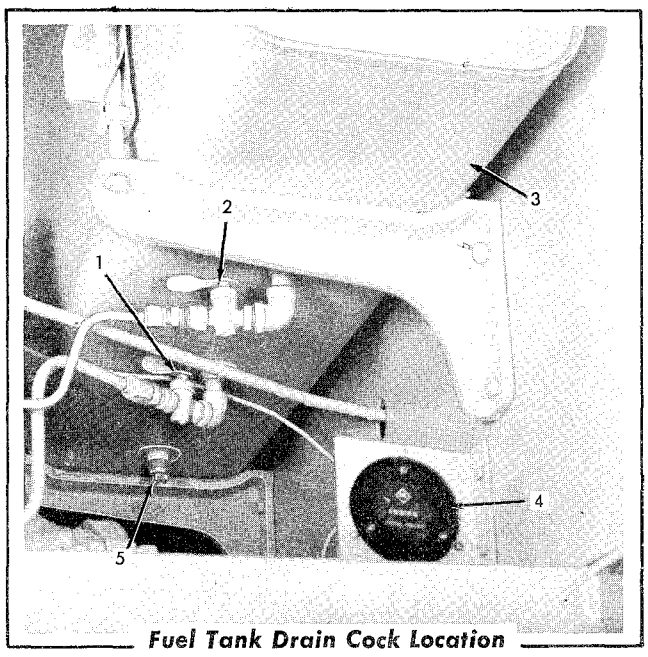
FUEL SYSTEM

A. FUEL TANK

The fuel tank of the grader should be filled at the end of each operating period rather than at the start. This will reduce the water content, as a full tank is less subject to condensation. If a large accumulation of rust or sediment is found when servicing the first stage fuel filter, the fuel tank should be drained and flushed.

B. FIRST AND SECOND STAGE FUEL FILTERS

The first and second stage fuel filters, mounted on the lower right side of the engine contain replacement type elements.



Fuel Tank Drain Cock Location

FIG. 24

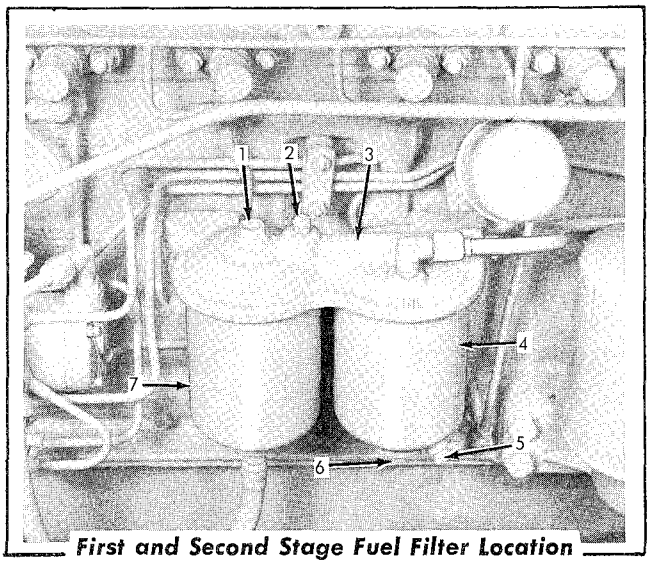
1. Fuel Supply Line Shut-Off Cock
2. Fuel Return Line Shut-Off Cock
3. Fuel Tank
4. Hour Meter (Special Equipment)
5. Fuel Tank Drain Cock

1. Service

Before starting the engine at the beginning of the day's operation in warm weather or shortly after stopping the engine at the end of the day's operation in cold weather, remove the drain plug located in the bottom of the first stage filter shell and allow the water and sediment to drain; install the drain plug when clean fuel runs out. Remove and replace the filter elements after every 400 hours of operation, or more often if conditions warrant.

2. To Replace First Stage Fuel Filter Element

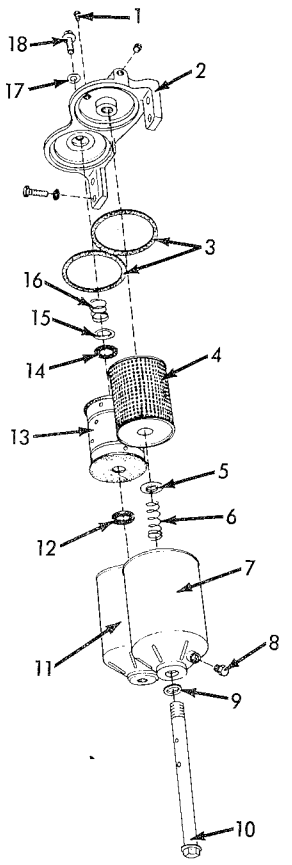
a. Close the fuel tank shut-off cocks. Thor-



First and Second Stage Fuel Filter Location

FIG. 25

1. Shell Retaining Bolt
2. Vent Plug
3. Filter Head
4. First Stage Fuel Filter
5. Drain Plug
6. Filter Centerbolt
7. Second Stage Fuel Filter



First and Second Stage Fuel Filter Details

FIG. 26

1. Vent Screw
2. First and Second Stage Fuel Filter Head
3. Shell Gasket
4. First Stage Filter Element
5. Spring Face Washer
6. Spring
7. First Stage Filter Shell
8. Drain Plug
9. Centerbolt Gasket
10. Shell Centerbolt
11. Second Stage Filter Shell
12. Element Gasket
13. Second Stage Filter Element
14. Element Gasket
15. Spring Face Washer
16. Spring
17. Gasket
18. Shell Retaining Bolt

oughly clean the filter head and the surrounding area. Loosen the vent screw in the top of the filter head and remove the drain plug from the bottom of the filter shell and allow the filter to drain.

b. Loosen the shell centerbolt and remove the centerbolt, filter shell, and the filter element as a unit from the filter head.

c. Discard the old filter element and the shell gasket. Thoroughly wash and dry the interior of the filter shell.

d. Install a new filter element (from the element replacement kit) and push it down firmly on the shell centerbolt.

e. Install a new shell gasket (from the element replacement kit) in position in the filter head. Hold the filter shell in position under the filter head and engage the threads of the shell centerbolt with the threads in the filter head and tighten the shell centerbolt.

f. Install the drain plug in the bottom of the filter shell and tighten securely. Open the fuel tank shut-off cocks and allow the filter to fill with fuel by gravity. When fuel (free of bubbles) flows from around the vent screw, tighten the vent screw securely. Check for leaks around the filter head and shell.

3. To Replace Second Stage Fuel Filter Element

a. Thoroughly clean the filter head and the surrounding area. Close the fuel tank shut-off cocks.

b. Remove the shell retaining bolt, located in the top of the filter head, and remove the filter shell and element as a unit.

c. Remove and discard the filter element and the two element gaskets. Remove the shell gasket from the filter head and discard.

d. Thoroughly wash and dry the interior of the filter shell.

e. Install a new element gasket in position on the shell centerbolt. Install a new element in position in the filter shell and push it down firmly on the shell centerbolt. Install a new element gasket in position on the shell centerbolt and down on top of the filter element. Install a new shell gasket in

position in the filter head.

f. Hold the filter shell in position under the filter head and install the shell retaining bolt and retaining bolt gasket. Tighten the shell retaining bolt securely.

g. Loosen the vent screw located in the top of the filter head.

h. Open the fuel tank shut-off cocks and allow the filter to fill with fuel by gravity. When fuel (free of bubbles) flows from around the vent screw, tighten the vent screw securely.

i. Check for fuel leaks and correct any leaks found.

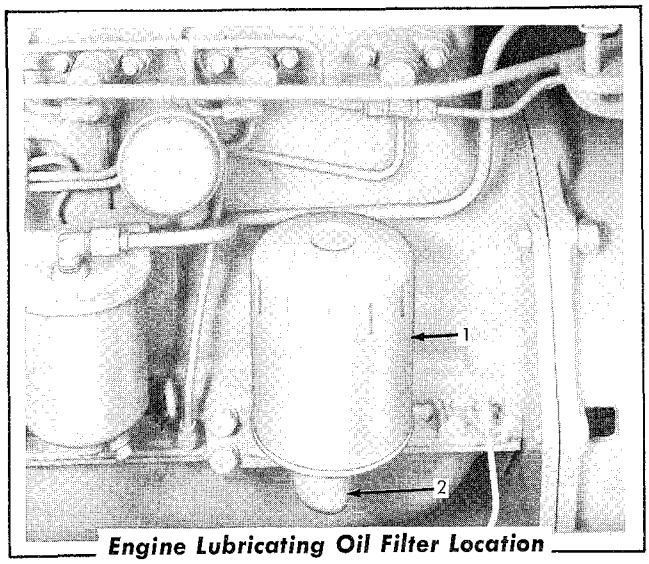
ENGINE LUBRICATION SYSTEM

A. Lubricating Oil Filter

The lubricating oil filter, located on the right side of the engine, is of the full flow throw-away type. The filter (Fig. 27) must be replaced after every 200 hours operation or more often if conditions warrant.

B. To Replace Filter Assembly

Thoroughly clean the filter base and surrounding area. Turn the filter counterclockwise and remove, then discard the filter. Coat the new filter gasket with clean engine oil. Turn filter into base until gasket contacts the base, then tighten an additional ½ turn. CAUTION: *Use hand pressure only when tightening the filter to the base.*



Engine Lubricating Oil Filter Location

FIG. 27

1. Oil Filter Assembly
2. Oil Filter Base

C. To Change Engine Oil

The engine crankcase lubricant must be drained and refilled to proper level with specified lubricant and a new lubricating oil filter 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.

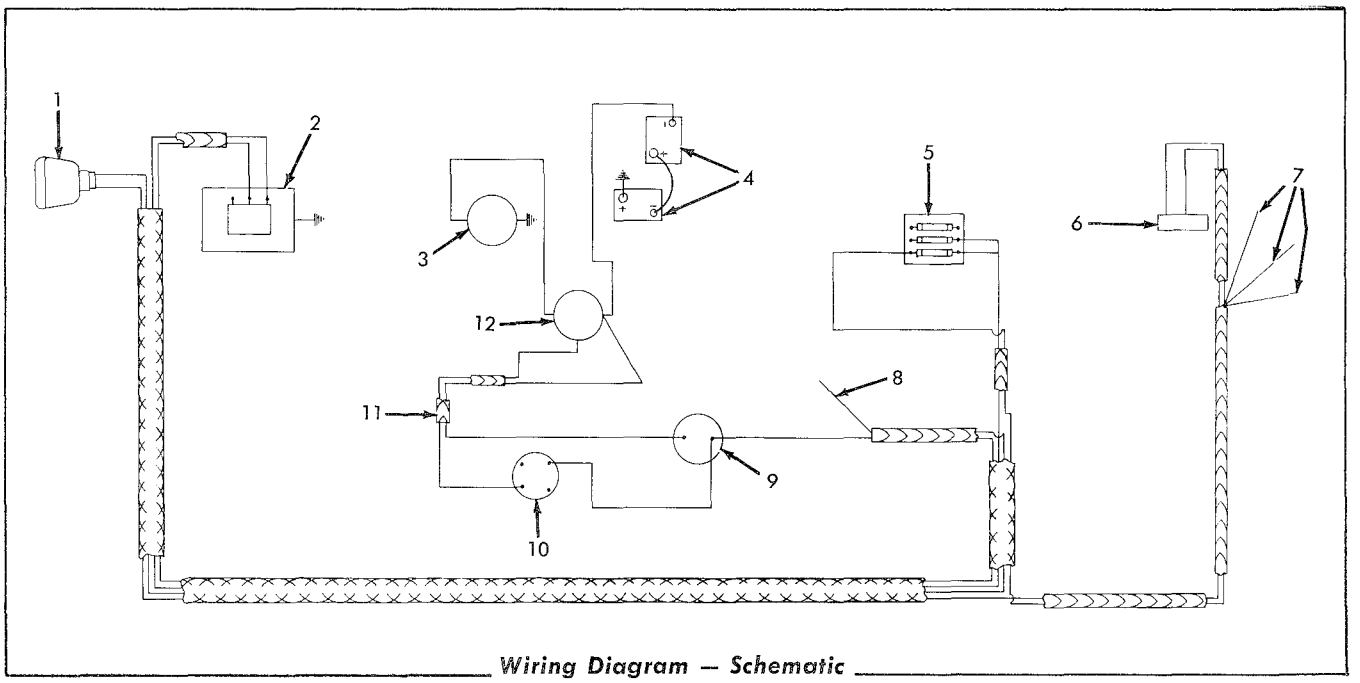
3. Install a new oil filter (refer to Paragraph B. above).

4. Fill the crankcase, through crankcase oil filler tube, with 1¼ gallons of specified lubricant.

5. Start engine and operate it at approximately ¼ throttle for several minutes. Observe oil filter for oil leakage.

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

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



Wiring Diagram — Schematic

FIG. 28

1. Stop Light
2. Generator and Generator Regulator
3. Starting Motor
4. Battery
5. Fuse Block
6. Stop Light Switch
7. To Head Lights (Special Equipment)
8. Accessory
9. Ammeter
10. Starter Switch
11. Connector
12. Starter Solenoid

A. Batteries

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

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

If the corrected readings are below 1.215, the batteries are not receiving sufficient charge. In zero weather there is danger of freezing if the specific gravity is below 1.100. Batteries with a specific gravity of 1.100 will freeze at 18° F.; batteries with a specific gravity of 1.220 will freeze at 31° below zero F. During freezing weather, any addition of water to the cells should be made after the engine is started at the beginning of an operating period to make certain that the water and electrolyte solution will be thoroughly mixed; otherwise it may freeze. The filler caps must be kept tight at all times and the tops of the batteries

kept clean and dry.

B. Generator and Generator Regulator

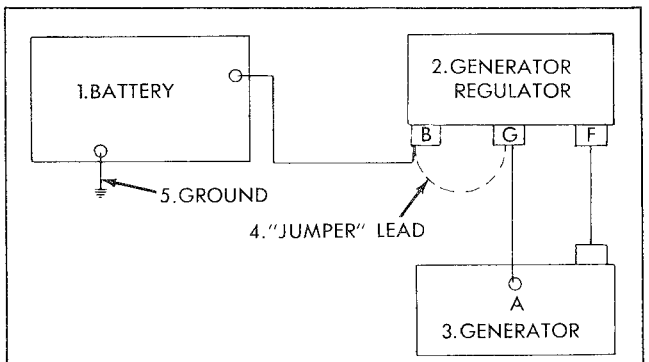
The generator and generator regulator are set to keep batteries fully charged under normal conditions. The ammeter should indicate a good rate of charge for a short time after starting the engine or until the generator replaces energy drained from batteries during cranking; then it will show little or 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. 29

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.

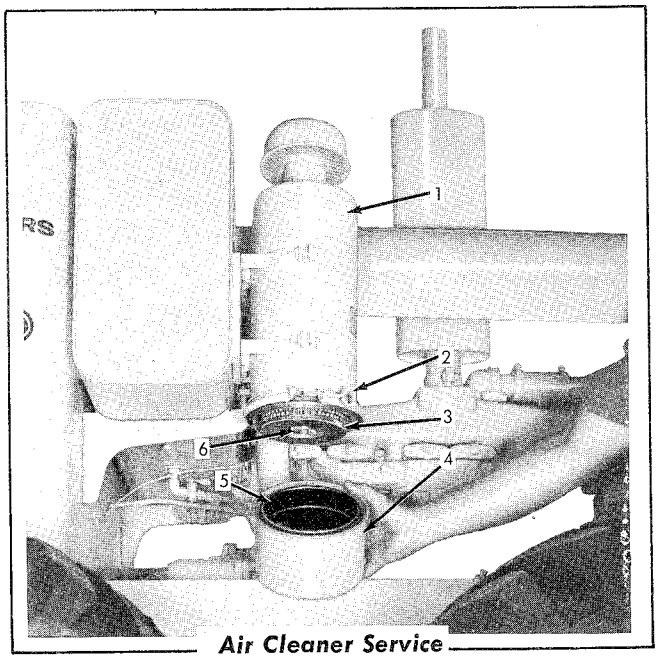
ENGINE AIR CLEANER

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.



Air Cleaner Service

FIG. 30

1. Engine Air Cleaner
2. Clamp
3. Filter Element
4. Dust Cup
5. Air Baffle
6. Wing Nut

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 psi. 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.

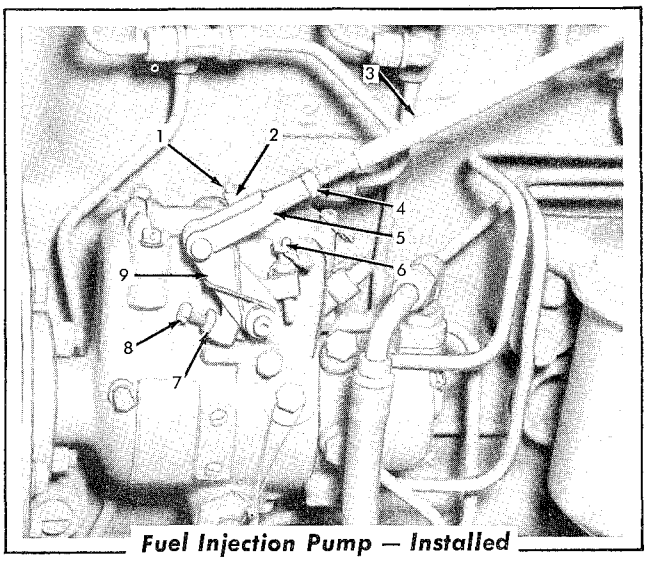
IMPORTANT: *A damaged hose, loose hose clamp, damaged gasket, damaged seal, or leak of any kind that allows air to enter the engine without first passing through the air cleaner will defeat the purpose of the air cleaner. Carefully inspect the air cleaner, air elbow, hose, and hose clamps connecting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

A. General

The throttle lever, located to the left side of the operator's seat, is connected by linkage to the speed control lever of the fuel injection pump. The throttle lever is used to control engine speed and shut off the engine. The engine will run at low idle speed with throttle lever against front side of stop on throttle lever quadrant; move throttle lever forward to increase engine speed as desired. To stop the engine, move throttle lever back to stop on quadrant, then push throttle lever away from quadrant and back until engine stops. Improper adjustment of throttle linkage may result in loss of engine speed or failure of engine to stop when throttle lever is moved past stop on quadrant.



Fuel Injection Pump — Installed

FIG. 31

1. Low Idle Screw
2. Lock Nut
3. Throttle Control Rod
4. Jam Nut
5. Adjusting Yoke
6. High Idle Stop Screw
7. Jam Nut
8. Engine Shut-Off Stop Screw
9. Speed Control Lever

B. Engine Governor

The governor was adjusted at the factory to provide the proper horsepower and a fully governed engine speed (under load) of 1650 R.P.M. Specified low and high idle engine speeds are 600 to 650 R.P.M. and 1765 to 1815 R.P.M., respectively. Should an adjustment of the governor become necessary, contact your nearest "Allis-Chalmers" Construction Machinery Dealer.

C. Adjustment of Throttle Control Linkage

If throttle controls fail to operate properly first make certain the linkage is properly lubricated and the condition is not due to binding or a broken spring. Refer to Fig. 31 and adjust throttle linkage as follows:

1. With engine stopped, adjust length of throttle control rod so that high idle stop screw just contacts stop when throttle lever is all the way forward.

2. Start the engine and allow it to warm up to normal operating temperature.

3. Position throttle lever against front side of stop on quadrant. Loosen lock nut on low idle screw. Using a 3/32" allen wrench, turn low idle screw as necessary until engine speed is 600 to 650 R.P.M. Tighten lock nut on low idle screw.

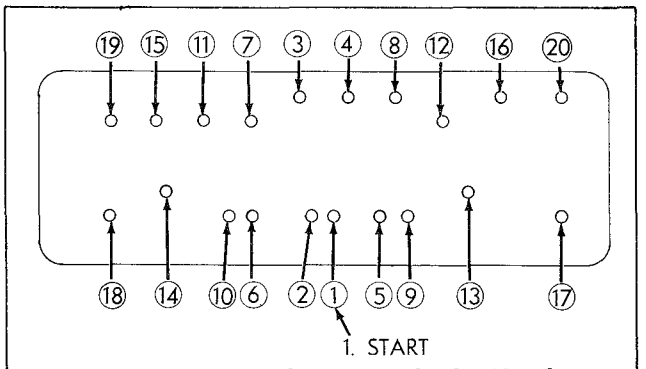
4. Loosen jam nut on engine shut-off stop screw and back the screw out about two turns. With throttle lever against stop on quadrant, push throttle lever away from quadrant and back to stop the engine. With engine stopped, turn stop screw in until it just contacts stop; secure stop screw with jam nut.

VALVE ADJUSTMENT AND CYLINDER HEAD

A. Valves

Correct clearance (lash) between the valve stems and the rocker arms must be maintained at all times. Insufficient valve clearance will cause loss of compression, misfiring, and will eventually cause burning of the valves and valve seats. Excessive clearance will result in faulty engine operation, valve tappet noise, and will cause rapid wear on the valve operating mechanism.

With the engine at normal operating temperature (160° to 185° F.) the proper valve lash is: intake valves .010" and exhaust valves .019". After any mechanical work has been done which would disturb the valve lash, the intake valves may be set "cold" at .013" and the exhaust valves at .022" clearance so that the engine may be run and allowed to warm up to normal operating temperature. After the engine has been "warmed up" to normal operating temperature, the valve lash should again be checked for proper clearance. NOTE: *The firing order of the engine is 1 - 5 - 3 - 6 - 2 - 4; the No. 1 cylinder is the cylinder nearest the cooling fan. The valve sequence starting at the fan end of engine is: Exhaust, Intake; Intake, Exhaust; Exhaust, Intake; Intake, Exhaust; Exhaust, Intake; Intake, Exhaust.*



Sequence of Tightening Cylinder Head Capscrews

FIG. 32

B. Cylinder Head

If the cylinder head is removed for any reason, the cylinder head capscrews must be tightened evenly following the sequence illustrated in Fig. 32. The specified torque for tightening the capscrews is 110 to 120 lbs. ft.

NOTE: *When tightening the capscrews; tighten evenly in increments of approximately 30 lbs. ft. until fully torqued.*

ENGINE CLUTCH ADJUSTMENT

A. General

The engine clutch is a spring-loaded, single plate, dry disc type clutch. The clutch is disengaged by depressing the clutch pedal. Linkage between the clutch pedal and the clutch release bearing actuates three release levers inside the clutch. Clearance must be maintained between the release bearing and the release levers, otherwise the clutch will not fully engage and slippage will occur. When the clutch is properly adjusted, the pedal free-play will be approximately 1¾". As the clutch facings wear, the clutch release levers move nearer to the clutch release bearing and the clearance is decreased, thus decreasing the free-play of the clutch pedal. When the free play of the clutch pedal has decreased to approximately ¾", an adjustment of the clutch is necessary.

B. Clutch Adjustment

To adjust the clutch, lengthen or shorten the clutch control rod, connecting the clutch pedal lever to the clutch shifter lever, as necessary to obtain 1¾" free-play of the clutch pedal.

BRAKE AND BRAKE ADJUSTMENT

A. General

The transmission type brake is installed on the brake drum, which is located on the front of the transmission bevel pinion shaft. The brake is actuated by a foot pedal and suitable connecting linkage.

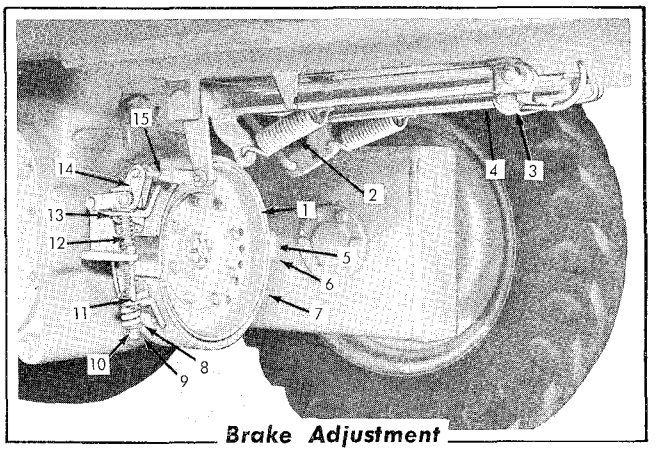
B. Brake Adjustment

1. Make certain the brake pedal moves freely on its shaft. The pedal retracting spring should return the pedal to the fully released position (pedal lever up against the floor plate).

2. With the brake pedal in this position, adjust the pedal pull rod so that the cam lever is parallel with its shoe on the brake band (fully released position).

3. Using a .015" thickness gage, check the clearance between the brake band and the drum at the brake band support bracket. Turn the adjusting screw, located in the support bracket, in or out as necessary to obtain a clearance of .015" at this point.

4. Turn the adjusting nut of the brake band support screw to obtain .015" clearance between the lower section of the brake band and the brake drum.



Brake Adjustment

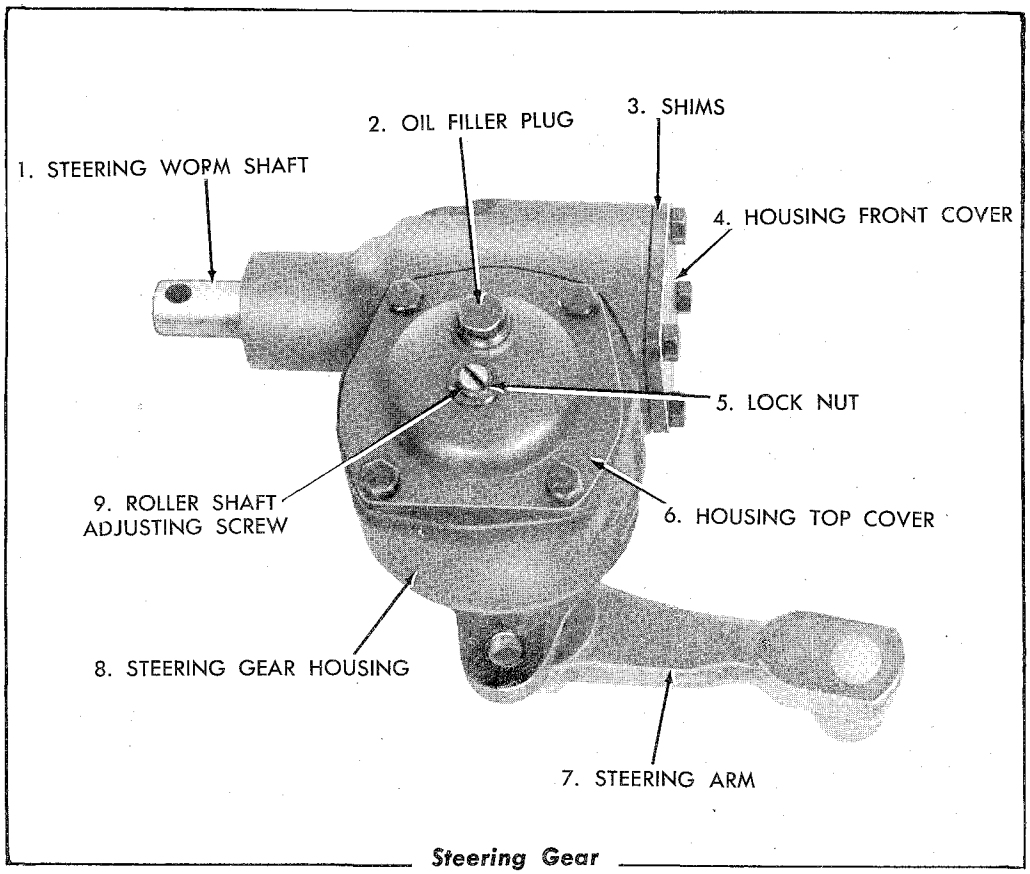
FIG. 33

1. Brake Drum
2. Pedal Retracting Spring
3. Stop Light Switch
4. Brake Operating Pedal Lever
5. Band Centering Screw
6. Support Bracket
7. Brake Band Assembly
8. Adjusting Bolt Spring
9. Jam Nut
10. Adjusting Nut
11. Support Screw
12. Expanding Spring
13. Cam Lever Shoe
14. Cam Lever
15. Pedal Pull Rod

5. Turn the adjusting nut of the brake band adjusting bolt to obtain .015" clearance between the upper section of the brake band and the brake drum.

6. After making all of the above adjustments, check between the brake band and the brake drum at several points for .015" clearance; this clearance will give approximately 2" free travel of the brake pedal.

ADJUSTMENT OF STEERING GEAR



Steering Gear

FIG. 34

Slack in the steering gear assembly may be caused by end play in the worm shaft, too much clearance between the worm and roller, or looseness in the steering drag link joints.

To determine which of the above conditions exist, raise the front wheels off the ground. Shake or twist the wheels by hand to find where the play is occurring.

Play in the steering drag link joints can be taken up by adjusting the drag link end plugs.

End play of the steering worm shaft indicates bearing looseness. To remedy this, the steering gear assembly must be removed from the grader. Remove shims from under the housing front cover, one at a time, until the end play is eliminated.

CAUTION: *The worm shaft must turn freely without binding after the adjustment is made.*

While the steering gear assembly is removed, check the play between the worm gear shaft and the roller shaft by turning the worm gear shaft back and forth and holding the steering arm. The roller can be meshed deeper in the worm by loosening the lock nut on the end of the roller shaft adjusting screw and turning the roller shaft adjusting screw in far enough to remove excess play. However, enough clearance must be provided to allow the shaft to work freely from one end of the worm to the other. CAUTION: *Do not drive the steering arm from the roller shaft; a puller must be used to prevent damage of the internal components.* Tighten the lock nut on the adjusting screw after the proper adjustment is obtained.

HYDRAULIC SYSTEM

A. Hydraulic Pump Drive Belt Adjustment

The hydraulic pump drive belts are properly adjusted when they can be pressed inward (by hand) approximately 1" at a point half-way between the crankshaft and the pump drive pulleys. To adjust, loosen the pump mounting bolts, move the pump to the position where correct tension of the belts is obtained and tighten the mounting bolts.

B. To Change Oil in Hydraulic System

1. Drive the front wheels of the grader up on blocks so that they are approximately 6" off the ground.

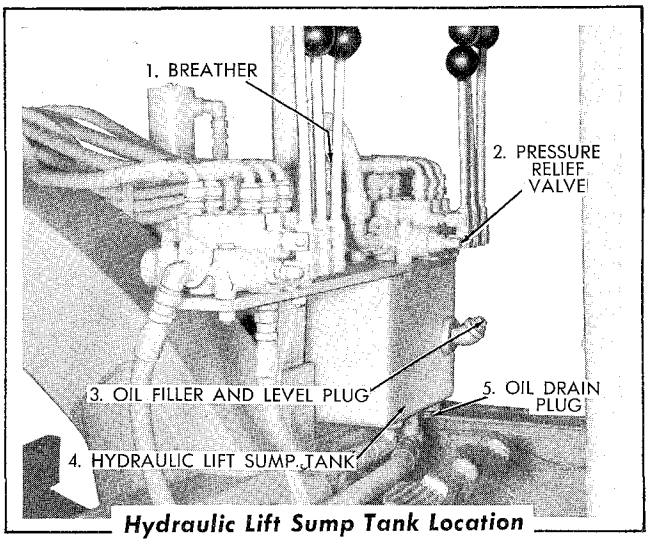
2. With the engine running, raise the moldboard to its maximum raised position, then stop the engine.

3. Remove the oil drain plug from hydraulic lift sump tank and allow the oil to drain. Move the moldboard hydraulic lift control levers and allow the moldboard to move to its lowest position, thus forcing the oil out of the hydraulic cylinders.

4. Install the oil drain plug and tighten securely.

5. Remove the oil level plug from the hydraulic lift sump tank and fill the tank with the specified oil to bring the oil level even with the filler elbow. Install the oil level plug.

6. Start the engine and operate the hydraulic lift control levers for the lift cylinders (raise and lower a few times) to fill the cylinders. Stop the engine and remove the oil level plug from the tank and add oil as necessary to bring the level even with the filler elbow. Install the oil level plug.



Hydraulic Lift Sump Tank Location

FIG. 35

7. Repeat Step 6 until the oil level in the tank is not lowered by operating the hydraulic lift cylinders.

C. Care of Hydraulic System

1. Use only CLEAN oil in the system; dirty oil causes rapid wear on the pump and valve parts.

2. Keep all pipe and hose connections tight and make certain that the hoses and lines are in good condition.

3. Replace any worn or damaged packings and seals.

4. When storing the grader or parking it in the open, raise the moldboard as far as it will go, thus protecting the rams of the hydraulic cylinders from the weather.

A. Front Wheel Alignment

The caster and camber of the front wheels are set at the factory and do not require field adjustment. The front wheels require ½ inch toe-in. To check for proper alignment, measure the distance between the tire rims (both ahead and back of the front axle); these measurements must be made at spindle height. The distance between the rims at the front must be ½ inch less than at the rear.

To adjust the toe-in, loosen the lock nut at each end of the tie rod. The threads on one end of the rod are left-hand and on the other end are right-hand. Turn the rod with a pipe wrench until the correct alignment is obtained, then tighten the lock nuts. The grader must be moved a short distance each time before checking for the correct adjustment.

B. Front Wheel Bearing Adjustment

Adjust the front wheel bearings by tightening the nut on the outer end of the spindle to draw the bearings up tight, then back the nut off ⅙ turn (to next cotter pin slot) and install the cotter pin.

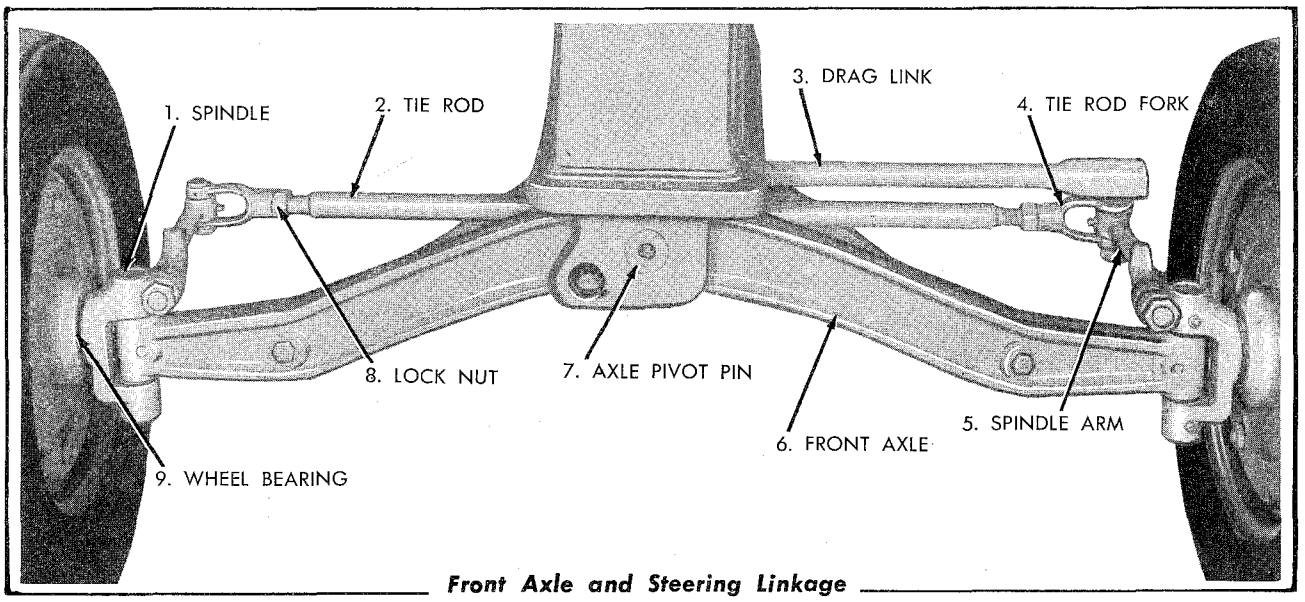
C. Tires

Keep the tires free from oil and grease, remove any stones that become lodged in the treads. Proper inflation and immediate repair of cuts will materially prolong their life. The recommended inflation pressures for the various sizes of tires that may be used on the grader are as follows:

Tire Size	Ply Rating	Recommended Inflation Pressure
6.50 — 16	6	40 lbs.
7.50 — 20	6	35 lbs.
8.25 — 20	6	35 lbs.
8.25 — 20	10	35 lbs.

NOTE: *To minimize movement of the grader on its blocking while in transit, the tires were purposely "over-inflated" at the factory. Before unloading the grader from its carrier, reduce the inflation pressure to the pressure recommended above.*

When shipped from the factory the four rear tires contain a total of approximately 380 pounds of 28% calcium chloride solution. Each rear tire is approximately ¾ full. The two front tires contain approximately 190 pounds of this solution. This liquid ballast affords increased traction through the addition of weight to the wheels at the most advantageous point (nearest the ground) and increases the stability of the grader.



Front Axle and Steering Linkage

FIG. 36

Amount and weight of calcium chloride solution per tire — factory installation:

Tire Size	Calcium Chloride Solution (Gals.)	Approx. Weight (Lbs.)
6.50 x 16	6.0	65
7.50 x 20	9.0	95
8.25 x 20	10.0	105

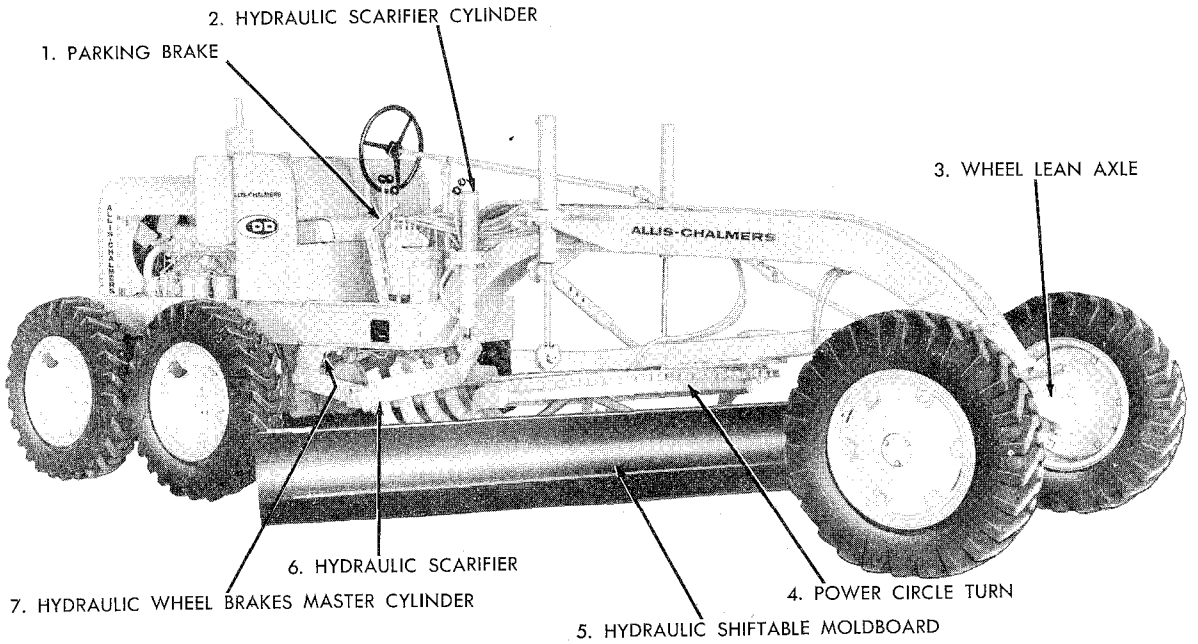
The solution will form a slush at approximately —20° F. but the tires will be comparatively safe until the slush freezes and becomes a solid mass which will not move inside the tires. Ordinarily, high pressures do not develop as the result of the slush forming inside the tires and a vehicle will be safe to operate until complete freezing has been affected. 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.

Tire companies have equipped their service stations with the necessary facilities to add solution to the tires.

When replacing a valve core, turn the wheel so the valve is at the top and raise the wheel from the ground to take the weight off the wheel before removing the valve core; this will prevent loss of the liquid solution.

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

SPECIAL EQUIPMENT



Model DD Motor Grader w/Special Equipment

FIG. 37

Special equipment is the term used to designate attachments which are not included on the standard grader, but are available to give added comfort and to increase grader operating efficiency under different conditions.

Special equipment may be ordered at additional cost for field installation or the grader may be ordered with factory installed special equipment or substitutions. Consult the nearest "Allis-Chalmers" Construction Machinery Dealer for

further information. The following special equipment items are available:

A. Scarifier

The scarifier is a hydraulically controlled, "V" type adjustable block, having a 27¾" swath and contains 7 removable teeth. The scarifier linkage is adjustable to compensate for tire size variations. One extra hydraulic control valve is required for operation of the scarifier.

B. Laterally Shiftable Moldboard

The laterally shiftable moldboard is operated by a hydraulic cylinder having a total piston rod travel of 32 inches (16 inches in either direction). One extra hydraulic control valve is required for operation of the laterally shiftable moldboard.

C. Power Circle Turn

The power circle turn provides 135° rotation of the circle. One extra hydraulic control valve is required for operation of the power circle turn.

D. Twelve and Fourteen Foot Moldboards

These moldboards are available as a substitution for the standard ten foot length moldboard.

E. Moldboard Extensions

Two foot long right or left hand extensions are available for use with the standard ten foot moldboard.

F. Cab

The cab is an all steel enclosure with an adjustable windshield and safety glass throughout.

G. Windshield Wiper

The windshield wiper is an electric, constant speed type.

H. Cab Heater

The cab heater is a hot water type, with a variable speed rheostat.

I. Windshield Defroster Fan

The defroster fan is an electric type; swivel mounted for convenient air stream direction.

J. Engine Hour Meter

The engine hour meter is a spring driven, electrically wound unit and records only when the grader engine is running. The hour meter can serve as a guide for the recommended service intervals.

K. Odometer

The odometer registers distances traveled in miles or kilometers.

L. Front Wheel Lean

The front wheel lean axle arrangement permits the front wheels to be leaned 25° to the right or left from vertical.

M. Tires

Tires of various sizes and ply ratings are available to meet special operating conditions.

N. Wheel Brakes

Hydraulic brakes are available for the four rear wheels. When the grader is equipped with hydraulic wheel brakes, the transmission brake is used as a parking brake, with the control lever located to the right side of hydraulic lift sump tank.

PREPARING GRADER FOR STORAGE

When it is necessary to store the grader during the winter or slack season, make a complete inspection of the grader for loose, worn, or damaged parts and have the necessary repairs made before it is stored.

To protect the rams of the hydraulic cylinders from the weather, raise the moldboard as far as it will go. Coat the moldboard with heavy grease to prevent rusting.

Drain the engine crankcase and all other oil compartments and refill them with new oil. To protect the fuel injection system of the engine, drain the fuel tank then pour about 3 gallons of a mixture of 40% mineral oil and 60% of the best kerosene in the fuel tank and run the engine for 15 minutes to circulate this mixture through the fuel system. This will leave the 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. Fill the fuel tank with regular "Diesel" fuel to minimize condensation in the tank. NOTE: *This storage fuel need not be drained when the grader is again placed in service.*

Remove the batteries, clean and store them in a cool, dry place. Test them once a month and recharge them if the specific gravity of the electrolyte falls below 1.220. Keep the specific gravity of the electrolyte above 1.220 to prevent the batteries from freezing.

Drain the engine cooling system or fill it with an anti-freeze solution that will withstand the lowest anticipated temperature.

Block up under the axles to remove the weight of the grader from the tires. Cover the exhaust pipe.